

## **REMARKS**

The instant Office Action was mailed March 12, 2004. Claims 1-12 are pending and were rejected.

### **I. Claim Objections**

The Examiner objected to claim 2. As such, this claim has been cancelled.

### **II. Claim Rejections under 35 U.S.C. § 112**

The Examiner rejected claim 12. As such, this claim has been cancelled.

### **III. Claim Rejections under 35 U.S.C. § 102**

The Examiner rejected claims 1, 2, and 3-11 as being anticipated by Rog, U.S. Patent No. 5,599,096. The Examiner also states with reference to Counciller's disclosure, applicant has not related or pointed out the difference between Counciller in claims 9 and 10.

The claims have been amended to define the invention as being "an extruder screw nose and flow channel head assembly" embodying the "screw nose . . . positioned in a transition space at said discharge end of said barrel." The independent claim is now claim 9, with dependent claims 3, 4, 5, 6, 10, and 11.

Claim 9 sets forth an extruder screw and flow channel head assembly with a screw nose positioned in a transition space at the discharge end of the barrel. The screw nose has a radially expanding upstream portion providing a conical surface of increasing diameter in the direction of flow for maintaining the rubber and working engagement with the cylinder wall. Claim 9 as amended distinguishes in a patentable manner over Rog, U.S. Patent No. 5,599,096 in that it sets forth the provision of a screw nose on the end of the screw positioned in a cylindrical barrel. In Rog the screw and the cylindrical barrel terminate at the end of the screw flights. A head portion having an increased diameter is mounted on the end of the cylindrical barrel and the disc component is mounted on the end of the screw flights. There is no teaching or showing of continuing the cylindrical barrel beyond the end of the screw flights or of increasing the diameter of the screw nose. As stated in claim 9 the "screw nose has a radially expanding upstream portion providing a conical surface of increasing diameter in the direction of flow of said rubber for maintaining said rubber in working engagement with said screw nose and the cylinder wall of

said cylindrical barrel.” This construction provides for maintaining pressure on the rubber in the transition space which is important when extruding visco-elastomeric materials to prevent the formation of bubbles in the extruded product.

In response to the statement that “a barrel with a constant diameter is not claimed” it is respectfully submitted that a “cylindrical barrel” as set forth in claim 9 inherently has a constant diameter. If a cylinder did not have a constant diameter, it would have a conical geometry.

It is respectfully submitted that if a barrel is “cylindrical” it has a constant diameter. This is clear from Webster’s Third New International Dictionary Unabridged 1986, in which the volume of a cylinder is  $V = \pi r^2 h$  where  $r$  equals the radius of the base,  $h$  equals height, and  $\pi$  equals 3.1416. The radius is one figure indicating the cylinder has a constant radius and therefore a constant diameter. This is an inherent characteristic of a cylindrical surface and therefore it would be clear to one skilled in the art. It is submitted that the definition in this specification does describe a barrel having a constant diameter because it describes “a cylindrical barrel” which therefore is a barrel with a constant diameter. This is also clear to one skilled in the machinery art as the definition for the “volume of a cylindrical surface” from Machinery’s Handbook is:  $V = .7854 d^2 h$  where “ $d$ ” equals the diameter of cylinder and, “ $h$ ” equals the length of the cylinder. This clearly indicates if it is a “cylinder” it has a constant diameter. Nevertheless, claim 9 has been amended to state the barrel has a constant diameter.

The reference to visco-elastomeric material in these remarks is not to limit the claims but to point out the unique results obtained with the extruder screw nose and cylindrical barrel configuration of the invention whereby pressure is maintained on the rubber to prevent the formation of bubbles. It is submitted that with the apparatus of Rog there is no maintenance of pressure but instead a reduction in pressure because of the increased diameter of the barrel.

Applicant further wishes to point out that in Rog there is no transition space between the screw nose and the cylindrical barrel. The space the Examiner refers to (Column 3, Lines 29 – 40) is between the enlarged chamber of the head portion 12 (defined in Column 3, Lines 20 – 26) and the screw nose. This is contrary to the teaching of applicants’ where there is no chamber of the head portion with surfaces 38, 40, and 42. The surface 44 of applicants’ apparatus is between the screw nose and the cylindrical barrel as defined in claim 9. In Rog the cylindrical barrel 14 terminates where the surface 40 of the head portion begins. The extruder screw nose of the

present invention is located in the cylindrical barrel before it terminates so that the pressure can be maintained on the extrudate material.

Claim 9 which is directed to the extruder and flow channel head assembly sets forth the unique arrangement of this invention wherein the extruder has “a cylindrical barrel” and a screw nose “having a radially expanding upstream portion providing a conical surface of increasing diameter in the direction of flow of said rubber for maintaining said rubber in working engagement with said screw nose and the cylindrical wall of said cylindrical barrel.”

Claim 9 is also believed to distinguish over Counciller which is directed to an injection molding apparatus where the screw is reciprocated to inject a thermoplastic material into a mold. The rotation of the screw causes the screw to retract as the barrel fills up with rubber. In the present invention, the screw remains stationary while moving the rubber from the feed end of the extruder to the discharge end. What is meant by stationary is that the screw rotates, but does not reciprocate backwards as in Counciller. Claim 9 requires that rubber be in working engagement with the screw nose and cylindrical wall of the barrel. This is impossible in Counciller since the screw moves backward while the rubber fills the barrel. For these reasons it is submitted that claim 9 as amended, clearly distinguishes in a patentable manner over Counciller.

Claim 10 which is dependent upon claim 9 further defines a downstream portion of the screw nose and its relation to the tapered wall of the flow channel head to maintain the working engagement of the rubber with the screw nose and tapered wall of the flow channel head. No such construction is shown or taught in Rog which has an enlarged head and chamber at the exit end of the screw thereby releasing the pressure rather than maintaining the working engagement. Claim 10 is believed to be allowable for this reason and for substantially the same reasons set forth above for claim 9.

Claim 11 which is dependent upon claim 10 is directed to providing a flow channel of constant cross-section to maintain pressure on the rubber. In Rog the operating member or screw is movable axially of the extruder depending upon the change in viscosity of the material. Also, by reducing the size of the outlet opening the backpressure can be increased and increase the temperature of the material. This is contrary to the teaching of the present invention where the extrusion of the rubber is provided under a controlled pressure to prevent formation of bubbles in the material. This requires a method and apparatus where the working of the rubber is provided

without causing excessive pressure and high temperatures. Claim 11 is believed to be allowable for this reason and for substantially the same reasons set forth above for claim 9.

Claims 3, 5, and 6 depend directly or indirectly from claim 9. As such the arguments for claim 9 are equally applicable here and are incorporated herein by reference.

**IV. Conclusion**

In response to the Office Action dated March 12, 2004, Claim 9 as amended and dependent claims 3, 4, 5, 6, 10, and 11 as amended are now believed to be in condition for allowance and such action is respectfully requested.

Respectfully submitted,

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